Observations on *Varanus s. salvator* in North Sulawesi

HAROLD F. DE LISLE
P.O. Box 1975
Twentynine Palms, CA 92277, US
varanus.org@earthlink.net

Abstract: Asian Water Monitors (*Varanus s. salvator*) are widespread on the main island of Sulawesi, Indonesia, but rather rare in the province of North Sulawesi because of human predation. This study documents observations on the daily behavior of a small coastal population over a two week period. Observations of aquatic behavior led to discussion of the possibility that this population is able to catch live fish in a particular coastal lagoon.

Introduction

The Asian Water Monitor (*Varanus salvator salvator*) is perhaps the most wide-spread of all varanids. It is found from Sri Lanka, northern India, Bangladesh, Burma, Vietnam and Hainan (China) through Malaysia east to the Indonesian islands of Sulawesi and Wetar (De Lisle, 1996). Its ability to colonize the remote islands of Malaysia and Indonesia might be due to its adaptability towards freshwater and saltwater (Traeholt, 1994a), and also its large size is an advantage, giving both the energy reserves and power to survive an extended sea voyage and a greater potential to actually achieve a landfall. Backwash from tsunamis could start this process frequently enough.

Figures 1A and B. Remnant primary forest on North Sulawesi
In March 2001, a month was spent in North Sulawesi Province, Indonesia (island of Sulawesi) to observe the northeastern-most populations of the Asian Water Monitor (*V. s. salvator*). It proved difficult to find observable populations. Most of the wildlife of North Sulawesi has been extirpated outside national parks and private reserves. The Minahasa people of North Sulawesi consider *biawak air* a favorite delicacy. Local inquiries to find monitors were often met with “Oh yes, whenever I see one I grab it to take home for dinner.”

A population was located in Tangkoko National Park. However, there are no accommodations of any kind within the park, and logistics of travel made observations impractical. A second population was located in a private preserve at Bentenan, approximately 75 km SW of Tangkoko.

**Methods**

Bentenan Preserve (1°00’49”N, 124°54’06”E) is a privately owned nature reserve of some 200 ha located on the shore of the Moluccan Sea. It consists mostly of secondary lowland tropical forest, with a lagoon between the beach and the forest. Bentenan lagoon is approximately 200 m by 50 m. There are two
small streams entering the lagoon from the forest, one at the north end and one at the south end. There is a 5 m wide channel connecting the lagoon to the sea. The water in the lagoon is brackish. The lagoon is a major part of the habitat of *Varanus salvator*.

Bentenan Lagoon must serve as a nursery for several kinds of fish. It is the most densely populated natural body of water ever seen by this author. A small dip net will bring up 10-15 small (2-5 mm) fish any place around the lagoon. Larger fish, probably mullet (*Mugil* sp.) also inhabit the lagoon.

Monitors frequented this lagoon, especially in the early morning. They proved very wary, and close approach was usually impossible. Gaulke et al. (1999) found similar flighty behavior in North Sumatra. Fortunately our cabin was perched on a knoll directly above the lagoon so that observations with binoculars (7 x 50 mm) were possible, although from a distance of 50-100 m. Such observations were made each morning from 0530-0800 h. Monitors were already in the water when it became light enough to see them. They were not seen to enter the lagoon before dark. Notes were taken on the number of lizards active
and on specific behaviors. Walks around the lagoon were also made daily later in the morning to find any monitors that might be basking. Observations in the forest were only possible from an established trail because of thick undergrowth.

The observation period was at the end of the northwest monsoon. Only a few afternoon showers occurred, but the early morning along the coast was mostly overcast.

Results

It was not possible to get a reliable estimate of the monitor population in Bentenan Lagoon, but it was probably fewer than 25 adults, perhaps as few as 15. Table 1 summarizes the daily observations during the hours when monitors were seen in the water. No monitors were ever seen in the water after 0900 h, and most had left by 0800 h. The monitors observed actively swam up and down the lagoon. The significance of this aquatic behavior will be discussed below.

Table 1. Summary of aquatic activity data of Varanus salvator in Bentenan lagoon
*Days on which monitors were actually observed with caught fish

<table>
<thead>
<tr>
<th>Date – March</th>
<th>Number of monitors in water</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>17</td>
<td>7</td>
</tr>
<tr>
<td>18</td>
<td>6</td>
</tr>
<tr>
<td>19</td>
<td>8*</td>
</tr>
<tr>
<td>20</td>
<td>6</td>
</tr>
<tr>
<td>21</td>
<td>9*</td>
</tr>
<tr>
<td>22</td>
<td>10</td>
</tr>
<tr>
<td>23</td>
<td>8</td>
</tr>
<tr>
<td>24</td>
<td>5*</td>
</tr>
<tr>
<td>25</td>
<td>11</td>
</tr>
<tr>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>27</td>
<td>7</td>
</tr>
</tbody>
</table>
Swimming. Typically monitors trolled the longitudinal axis of the lagoon. They swam both near shore and well out toward the center of the lagoon. No particular path pattern was observed. Generally only the head was visible (Fig. 8), and a wake made by the tail. Only monitors of >1 m could be observed reliably from our platform. The water was also roiled during the early morning hours by the thousands of small fish surface feeding. Thus it is not known whether juveniles were also swimming. The only juveniles observed were on shore on the seaward side of the lagoon.

Traeholt (1993) is of the opinion that *V. salvator* is unable to catch fish. This conclusion is drawn from experiments he conducted with captive juveniles who were unable to catch small fish in a tub. However, he leaves open the question that some populations may well have developed the ability to catch fish where other food sources are scarce. The observations made at Bentenan do not indicate how often or even if, the lizards caught the small fish in the lagoon. It probably would not have required the ‘open pursuit’ technique outlined by Traeholt (1994a), nor would vision have to be employed. Just opening their mouths could probably snare a few fish. Three times monitors were observed exiting the water with a large fish (Mugil?) in their jaws. All monitors exited the lagoon on the forest side. No adults were ever seen on the beach side which had a ca. 2 m border of salt grass between the water and sand.

Basking. After departing the lagoon into the forest, most monitors were not seen again until the next day. One large (ca. 2 m) lizard did, however, have a favored basking site near the point (see Fig. 6) on the forest side of the lagoon. There was a large snag that pointed out about 1 m above the water at that point. This could not be seen from the observation platform, but when approached cautiously from the beach side, the monitor could be seen basking almost daily between 0900-1000 h. Standing up or any sudden movement by the observer would cause the lizard to immediately dive into the water, even though we were more than 50 m distant. Attempts were made to approach from the landward side, but crawling through the brush made noise and the lizard could be heard hitting the water before we ever got within sight.

Rathnayake et al. (2003), in Sri Lanka, found that most of the water monitors there basked in trees over
15 m above ground. No monitors were observed in the forest at Bentenan, but they were obviously there, perhaps spending much of the day up in the trees.

Three juvenile *V. salvator* were observed during walks around the lagoon. They were all partially concealed in the salt grass on the beach side of the lagoon. Times of observation were ca. 1000, 1100, and 1300 h respectively.

**Discussion**

*Varanus salvator* inhabits a wide range of habitats across its wide distribution – from highlands (1100 m in south Sumatra; Erdelen, 1991) to coral islands devoid of substantive aquatic habitat (Pulau Tulai; Traeholt, 1994b) to mangrove swamps (Pardav and Chondhury, 1996). It is thus to be expected that behavioral ecology is equally divergent.

There are no mammalian predators in North Sulawesi larger than a civet (Whitten et al., 2003). The only animal (excepting humans) posing a threat to adult monitors is the Reticulated python (*Python reticulatus*). So it is quite possible for the monitors at Bentenan to spend the night in trees rather than in burrows as is more typical on the Asian mainland. There were no burrows observed any place around the shore of the lagoon.

A night spent up in the trees could explain the early hour of rising at Bentenan, presumably at dawn, since they were already in the water by 0600 h. Wickramanayake and Green (1989) and Rathnayake et al. (2003) found monitors on their study sites in Sri Lanka also swimming at 0600 h. On the other extreme, Traeholt’s (1995) population did not become active until 1000 h.

Fish have rarely been found in diet analyses of *V. salvator*. However, most stomach analyses have been done of specimens trapped in palm plantations where small streams are the aquatic habitat (Shine et al. 1998). Most people of southeast Asia familiar with this monitor insist it does catch fish (Traeholt 1994a). Harrison and Lim (1957), Deraniyagala (1931), Smith (1932), and Gaulke (1991) all state it can catch fish. Gaulke is the only one to have reported actually seeing *V. salvator* ssp. in the Philippines eating fish trapped in pools at low tide. This study may be the first report of direct sighting of water monitors catching fish in an open body of water.

What is the significance of this early morning swimming behavior? The swimming did not appear to be random, but a kind of trolling up and down the lagoon. Several hypotheses present themselves: (1) The monitors were taking their morning exercise (I am sure that this hypothesis may be favored by certain amateur reptile keepers.). But anthropomorphisms aside, (2) The monitors were thermoregulating. At 0600 h surface water temperature in the lagoon was 29º C; air temperature was 23º-24º C. This explanation seems to be favored by Rathnayake et al. (2003) in their study of thermal behavior. However, most lizards engaged in thermoregulation find a spot with favorable temperatures and remain there. They do not expend energy running (or swimming) around. (3) The monitors are foraging. Direct evidence for this is slight. Three fish in 12 days hardly seems energy efficient. Indirect evidence, however, is substantial. The trolling-like swimming indicates some purposeful activity. It occurs only in the early morning. As every fisherman knows, fish feed near the surface in the early morning. The fish population in Benentan lagoon is so dense it would seem possible that fish could be caught without the “open pursuit” technique outlined by Traeholt (1994a). They possibly swallowed large numbers of smaller fish unobserved, but for some reason took larger fish to shore. It is also possible that the fish caught and observed were already dead, although no dead fish were ever seen floating near shore.

It should be mentioned that the thermoregulatory and foraging hypotheses are not necessarily mutually exclusive.

Few conclusions can be drawn about basking behavior. Most of the population spends most of the day in the forest, presumably using the canopy for basking. We observed a number of fruiting trees in the forest
and signs of rodent activity. There are 43 species of rats on Sulawesi (Whitten et al., 2002). There should be abundant prey for monitors in the forest and much of their time there may be taken up with foraging.

Acknowledgements

My special thanks to Mr. Nyoman Dewantara, interpreter and companion, without whose help traveling to the remote areas of Indonesia would not have been possible (even if he refused to get closer than two meters to any reptile). We also appreciated the assistance of our Minahasa guides in Tangkoko and Bentenan. Agus (many Indonesians use only a single name) showed us the trails at Bentenan and how to spot juvenile monitors in the salt grass. I thank Samuel S. Sweet for his assistance with the manuscript.

Literature Cited


**Addendum:** In the just-published revision of the *Varanus salvator* complex (Koch et al., 2007. Mertensiella 16:109-180) the nominotypic form, *V. s. salvator*, is now restricted to Sri Lanka. The Bentenan, Sulawesi population belongs to Koch’s “typically-colored”(spotted) phenotype, presently listed by him as *Varanus salvator* ssp.